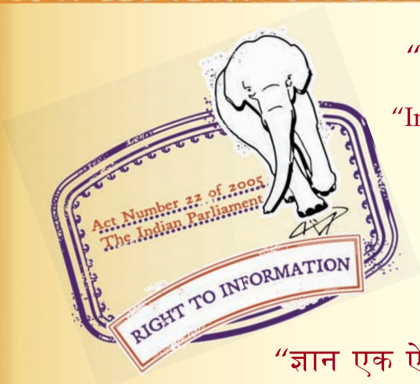
IS 11700 (1986): Type B helical video recorders [LITD 7: Audio, Video and Multimedia Systems and Equipment]



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IS : 11700 - 1986
(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR TYPE B HELICAL VIDEO TAPE RECORDERS

UDC 621·397·452

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 January 1987

Indian Standard
SPECIFICATION FOR TYPE B HELICAL VIDEO TAPE RECORDERS

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Indian Standard

SPECIFICATION FOR TYPE B HELICAL VIDEO TAPE RECORDERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 26 May 1986, after the draft finalized by the Recording Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The object of this standard is to define electrical and mechanical characteristics of equipment which will provide for interchangeability of recordings. The requirements given are related to 625 line-50 Hz field systems.

0.3 While preparing this standard, assistance has been derived from IEC Pub 602 (1980) 'Type B helical video recorders', issued by the International Electrotechnical Commission (IEC).

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard applies to magnetic video recording and/or reproduction using 25·4 mm tape on Type B helical-scan recorders suitable for broadcast applications.

2. TERMINOLOGY

2.0 For the purpose of this standard, the terms and definitions given in IS : 1885 (Part 48)-1978† shall apply in addition to the following.

*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary : Part 48 Recording, Section 1 Tape recording, and Section 2 Disk recording.

2.1 Type B Helical Video Tape Recorders — A 25·4 mm segmented field recording two-head system which segments the image into groups of horizontal lines.

3. FORMAT DESCRIPTION

3.1 Two recording heads are used in 625-50 systems, each head records one-sixth of the field.

4. ENVIRONMENT

4.1 Tests and measurements made on the recorder to check the requirements of this standard shall be carried out under the following conditions:

Temperature	:	25 ± 1°C
Relative humidity	:	48% to 52%
Barometric pressure	:	86 kPa to 106 kPa
Conditioning before testing	:	24 h

5. TAPE AND SPOOLS

5.1 Dimensions of Magnetic Tape for Television

5.1.1 The magnetic tape used for television recording shall conform to the dimensions given in Table 1.

TABLE 1 DIMENSIONS OF MAGNETIC TAPE

Width (mm)	$25\cdot350 \begin{smallmatrix} +\ 0\cdot025 \\ -\ 0\cdot025 \end{smallmatrix}$
Maximum overall thickness (mm)	0·032
Maximum curvature (mm)	1·3 in 1 m

NOTE — The curvature shall be measured by constraining the tape to lie in a plane under zero tension and by positioning a straight edge of the specified length as shown in Fig. 1.

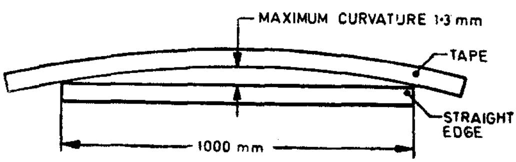


FIG. 1 MEASUREMENT OF CURVATURE OF MAGNETIC TAPE

5.2 Spools

5.2.1 Spools shall conform to the requirements of IS : 10351-1982* in which the preferred reel sizes are also listed. If a friction ring is used, dimension, *C*, shall be 115^{+2}_{-1} mm.

If provided, the friction ring should not impair spool performance.

5.2.2 A minimum distance of 5 mm from the tape stack to the spool periphery shall be allowed. Approximate spool capacities are given in Table 2.

TABLE 2 APPROXIMATE SPOOL CAPACITIES

Diameter of Spool mm	Approximate Capacity m	Approximate Maximum Playing Time min
(1)	(2)	(3)
203	650	43
229	900	62
248	1 125	77
267	1 400	95

5.3 Magnetic Tape Properties

5.3.1 The magnetic coating shall be longitudinally oriented.

5.3.2 The coercivity shall be more than 30×10^3 A/m.

6. MECHANICAL PARAMETERS

6.1 Scanning Configuration

6.1.1 The dimensions of the scanning configuration shall be as specified in Fig. 2 and in Table 3.

6.2 Speeds of Tape and Video-Head Wheel

6.2.1 The nominal linear speed of the tape shall conform with Table 4.

6.3 Position of Recorded Tracks

6.3.1 The position and dimensions of video, audio, control and cue tracks shall be in accordance with Fig. 3 and Table 5.

*Spools for 25·4 mm video magnetic tape.

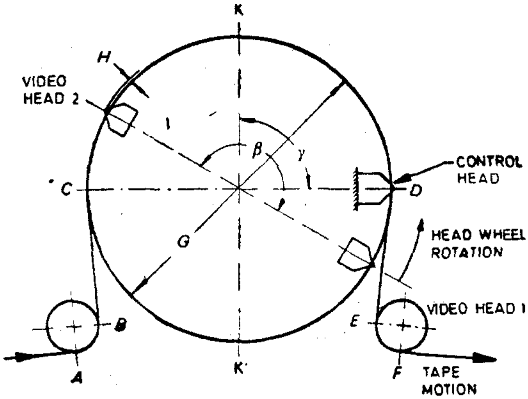


FIG. 2 SCANNING CONFIGURATION

TABLE 3 DIMENSIONS OF SCANNING CONFIGURATION

(*Clause* 6.1.1)

Drum diameter, *G* (mm)	$50{\cdot}33^{\ 0{\cdot}000}_{-0{\cdot}003}$
Tip penetration, *H* (mm)	0·060, *Max*
Angular separation between the video-heads, β	180° ± 30″ measured from gap to gap of video head 1 and 2
Control-head angle to centre line, *Y*	90° ± 15″ *K-K′* to control head gap
Tape tension, *T* in	Measured between *B* and *C*: 2N ± 10%
Tape tension *T* out	Measured between *D* and *E*: 2·3 N ± 10%

NOTE — Video-head gap shall be 90° nominal to the plane of rotation of the video head.

TABLE 4 NOMINAL LINEAR SPEED OF TAPE

(*Clause* 6.2.1)

	625 LINE-50 FIELD SYSTEM
Nominal linear tape speed (cm/s)	24·3 ± 0·12
Nominal rotational speed of head wheel (rev/s)	150

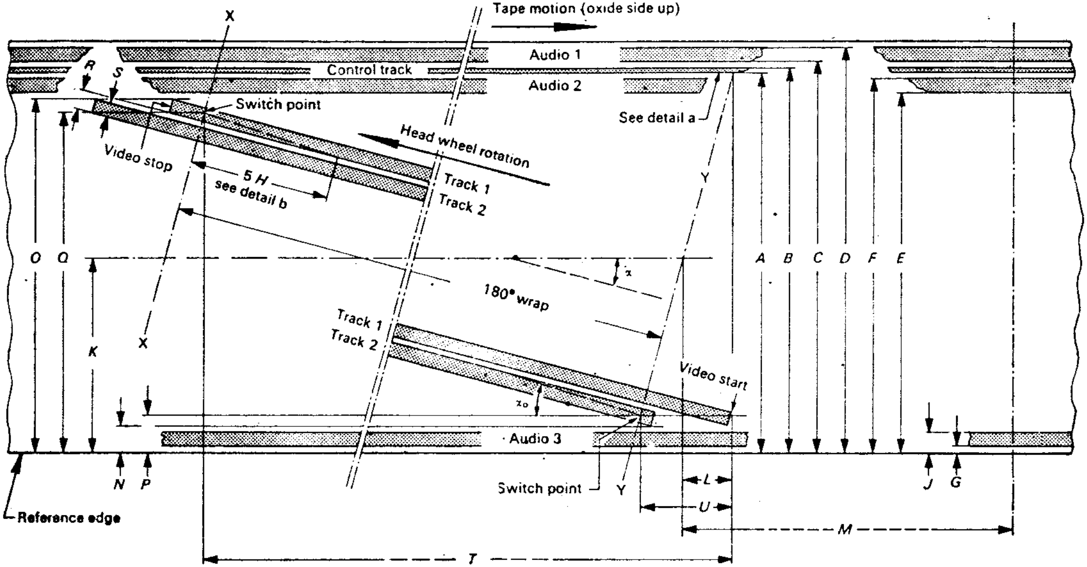


FIG. 3 TAPE FORMAT — *Continued*

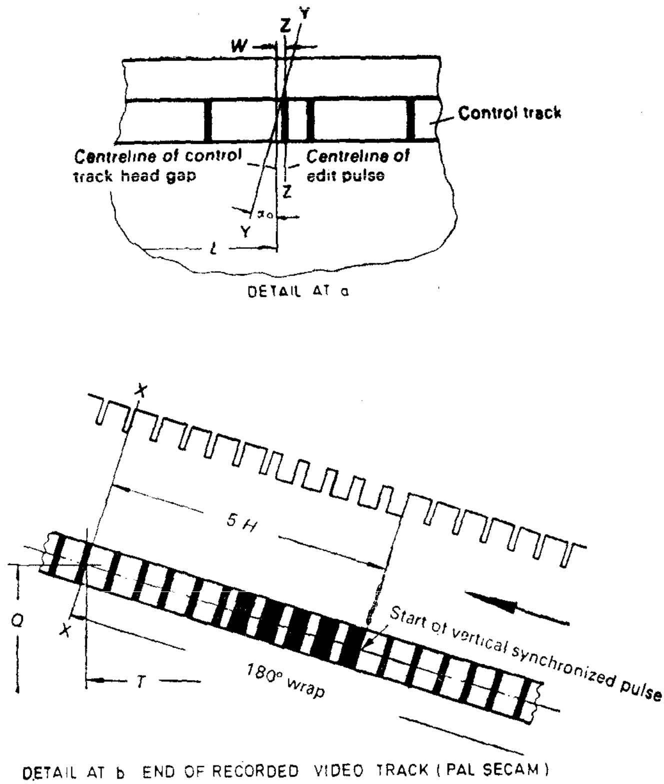


FIG. 3 TAPE FORMAT

The audio and cue recordings shall be so positioned along the tape as to lead the associated video information by 232·5 ± 0·5 mm as indicated in Fig. 3, dimension, *M*.

7. ELECTRICAL PARAMETERS

7.1 Modulation System

7.1.1 The video information shall be recorded in the form of an rf signal frequency modulated by the video signal. The instantaneous frequencies of the rf signal shall vary linearly with respect to the amplitude of the modulating signal.

TABLE 5 DIMENSIONS OF VIDEO, AUDIO AND CONTROL TRACK

(*Clause* 6.3.1)

DIMENSIONS		mm
(1)	(2)	(3)
A Control track	*b**	23·55, *Min* 23·65, *Max*
B	*t*†	23·95, *Min* 24·06, *Max*
C Audio 1 track	*b**	24·35, *Min* 24·45, *Max*
D	*t*†	25·15, *Min* 25·26, *Max*
E Audio 2 track	*b**	22·35, *Min* 22·45, *Max*
F	*t*†	23·15, *Min* 23·26, *Max*
G Audio 3 track	*b**	0·15, *Min* 0·25, *Max*
J	*t*†	0·95, *Min* 1·05, *Max*
K Centre of video tape		12·70, Ref
L Position of control-head		2·84, *Min* 2·88, *Max*
M Position of audio heads		232·0, *Min* 233·0, *Max*
N Full video width	*b**	1·18, *Min*
O	*t*†	22·19, *Max*
P Video width 180°	*b**	1·82, Ref
Q	*t*†	21·55, Ref
R Video track pitch		0·200, Ref
S Video track width		0·155, *Min* 0·165, *Max*
T Switch point video track 2		82·096, *Min* 82·121, *Max*
U Switch point video track 1		5·523, *Min* 5·533, *Max*
W Distance between control track head-gap and centre edit pulse at 180° switch point		0·040, Ref
Scanning angle		14·434°
Video track angle 625 line-50 field system		14·289°

**b* is the dimension from the reference edge to the bottom of the record.

†*t* is the dimension from reference edge to the top of the record.

7.2 Characteristic Frequencies

7.2.1 The instantaneous frequencies of the rf signal corresponding to characteristic levels of the video signal for the television system is described in Table 6.

TABLE 6 INSTANTANEOUS FREQUENCIES OF rf SIGNAL

	Television system	625-50
	Synchronization/vision ratio	0·3/0·7
Video levels	Synchronization tip, MHz	6·76
Video levels	Blanking, MHz	7·40
Video levels	Peak white, MHz	8·90

The tolerance on the indicated frequencies shall be ± 0·05 MHz for blanking and peak white.

7.3 Pre-emphasis and De-emphasis

7.3.1 The time constants of the video emphasis networks are defined in Table 7.

TABLE 7 TIME CONSTANTS

Time Constants ns	625-50
(1)	(2)
t_1	240
t_2	600

7.4 Recording of Audio Track

7.4.1 The recorded reference audio level (1 KHz frequency) on all the three audio tracks should correspond to a magnetic short-circuit flux level 90 ± 5n Wb/m rms for 625-50 systems. This level is intended to be nominally 9 dB below the recorded level that would produce 3 percent third harmonic distortion.

7.4.2 A time constant t_1 of 15 μs is applied.

7.4.3 Audio 3 is an independent audio track. Time and control code, defined in Indian Standard Time and Control Code for Video Tape Recordings (*under preparation*), if used, shall be recorded on this track.

NOTE — Till such time the standard under preparation is published, the matter shall be subject to agreement between the concerned parties.

The recorded time and control code should correspond to a peak-to-peak magnetic short-circuit magnetic flux of 720 ± 70 nWb/m (720 nWb/m peak-to-peak corresponds to 254 nWb/m rms for a sinusoidal waveform).

7.4.4 The monophonic sound signal shall be recorded on audio track 1.

7.4.5 In case of stereophonic recording, audio track 1 shall carry the left channel and audio track 2 the right channel.

7.4.6 When the same signal is recorded on the audio 1 and audio 2 tracks, these tracks shall be so phased that when reproduced with a head wide enough to sense the recorded flux on both records, they will be additive. The recorded control track between audio tracks 1 and 2 is not considered.

7.4.7 The azimuth of all head-gaps used to produce longitudinal track records shall be perpendicular to the direction of the relative head-to-tape motion.

7.5 Specification of Recording of Field Synchronizing and Control Signals

7.5.1 The position of the field sychronizing signal on the video tracks should be as indicated in Fig. 4.

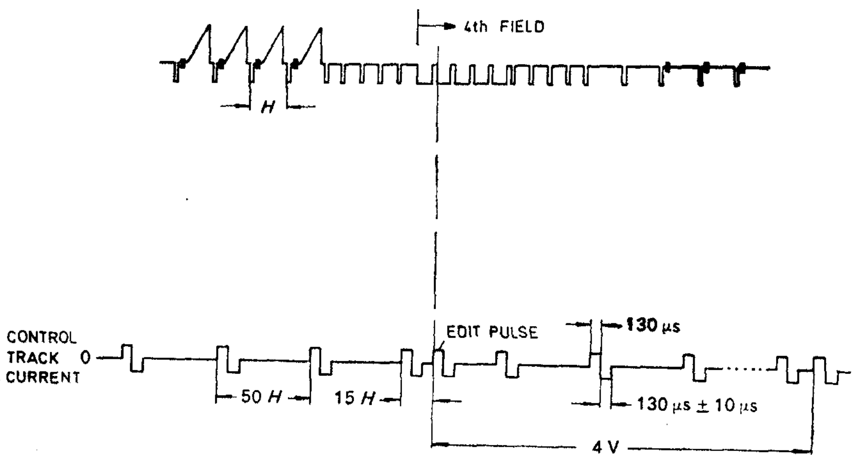


FIG. 4 POSITION AND WAVEFORM OF CONTROL TRACK AND PULSE SYSTEM 625-50-PAL/SECAM

7.5.2 The signal recorded on the control track consists of a train of tracking pulses and additional editing pulses as indicated in Fig. 4. A supplementary edit pulse may be added for the PAL-8 field-sequence recognition.

7.5.3 The polarity of the tracking pulses should be as follows; if the tracking pulses on the tape are regarded as discrete magnets, the leading part of the pulses constitute a magnet whose south-seeking pole points in the direction of tape motion.

7.5.4 The amplitude of the control signal current flowing through the recording head should be such that the tape is driven to the verge of saturation.

NOTE — The definition of these parameters and the discussions referring to them are given in Appendix A for television systems identified in Table 7.

APPENDIX A

(*Clause* 7.5.4)

TRANSMISSION CHARACTERISTICS OF SIGNAL CHAIN

A-0. The transmission characteristics of signal chain of a television tape recorder may be defined according to one of two different methods which are not in disagreement.

A-1. DEFINITION OF RECORDING CHAIN

A-1.1 For reference purpose, an ideal recording chain is defined as consisting of :

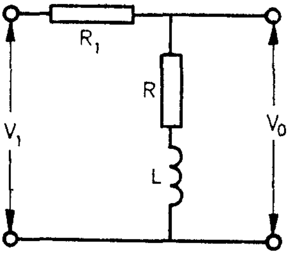
a) a modulator having a flat frequency response with respect to the modulating video frequencies,

b) an rf section having a transfer characteristic such as to produce constant amplitude alternating magnetic flux in video-head pole tips when driven by an alternating signal from the modulator having constant amplitude, and

c) a video pre-emphasis network inserted before the modulation stage.

A-1.2 The pre-emphasis is then defined by frequency and phase characteristics of a network such as that shown in Fig. 5, fed from a low-impedance source and feeding a high-impedance load.

A-1.3 The ideal recording chain described above is intended to be taken as a basis for producing reference tapes to be used for the alignment of television tape-recorders.



$$\tau_1 = \frac{L}{R_1 + R}$$

$$\tau_2 = \frac{L}{R}$$

$$\frac{V_0}{V_1} = \frac{(1 + j\omega t_2)\, t_1}{(1 + j\omega t_1)\, t_2}$$

τ_1 and τ_2 = time constants, in microseconds
R and R_1 = resistance, in ohms
L = inductance, in milli henries

FIG. 5 NETWORK FOR DEFINING PRE-EMPHASIS

A-1.4 In practice, when using present-day recording chains, the following points should also be considered:

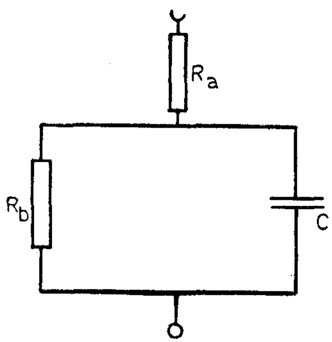
a) an approximately linear relationship exists between the magnetic flux emanating from video-head pole tips and the rf current flowing through the video-head windings;

b) amplitude of the recording current in video-heads should be such as to produce maximum rf output, in replay, at the frequency corresponding to mid-grey level.

A-2. DEFINITION OF PLAYBACK CHAIN

A-2.1 In this case, all video circuits of the specified playback chain are supposed to have a flat amplitude-frequency response with the exception of video de-emphasis network which is described below.

A-2.2 The video de-emphasis curves are defined as the normalized impedance of the two-terminal network of Fig. 6.



$$\tau_1 = \frac{R_a R_b}{R_a + R_b} C \quad \tau_2 = R_b C$$

τ_1 and τ_2 = time constants, in microseconds
R_a and R_b = resistance, in ohms
C = capacitance, in microfarads

FIG. 6 NETWORK FOR DEFINING DE-EMPHASIS

A-2.3 The de-emphasis network is introduced following the demodulator in the signal playback circuitry (to obtain a flat input-to-output video response over the passband of interest, a complementary pre-emphasis network is introduced ahead of the frequency modulator stage during recording).

A-2.4 This definition assumes that all pre-emphasis and de-emphasis is placed in video portion of the signal path and that the response of the rf portion of the signal path is flat over the passband in question. Ideally, the magnitude of the remnant flux on a recorded tape should be independent of frequency over the frequency range concerned but since there is no practical way of measuring it, the most practical approach is to ensure that the recording current in the video-heads is independent of frequency over the passband.